

## ***An Effective Short Course on Research Integrity***

Bernard S. Gerstman, Department of Physics, Florida International University, USA

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Ethical conduct in research has always been considered of utmost importance within the research community. Historically, it was assumed that scientific ethics did not require special training. Instead, the ethical manner in which to carry out research was presumed to be learned by new scientists automatically and unconsciously, as if by osmosis, as the technical aspects of the research were carefully taught by their superiors. This was of course, never true. Mendel and Millikan may have fudged their data, along with numerous others of less renown.

More recently, consideration has been given to developing methods for training scientists in research ethics, rather than relying on osmosis (1). Part of the impetus for this change is that the problems associated with unethical procedures in research have become especially visible to the public when they occur in research in the health sciences (2). This paper reports on a course of short duration that is designed to train students efficiently and effectively in the ethical conduct of research.

### **Design**

The course is designed for graduate students and undergraduates who have shown an interest in a career in science. There is no obvious reason why the course design would not be applicable to students outside the sciences. At this time, all science majors at the home institution do not take the course. The science undergraduates who are required to take the course are affiliated with special programs such as the Research Experience for Undergraduates funded by the NSF as well as NIH funded programs.

The course is designed to meet for one hour each week and to contain a maximum of 15 students. If necessary, such as in summer sessions, the course can be compressed into a two-week period, but some of its effectiveness is lost. This will be discussed later in this section when the reason for this loss in effectiveness will be clear.

The initial course meetings are organized like a traditional class with the faculty member explaining various aspects of research integrity and unethical behavior. This is best introduced by a short (one hour) summary of the general principles of ethics in western society, which can then be used as the basis for the principles of research integrity and ethics. It is important that this explanation of ethics in general be presented as a summary. If it is presented in another form, such as an "Introduction to Western Ethics" or any other form that does not convey immediate *de facto* credibility, the course runs the danger of degenerating into a philosophy discussion on ethics in general. Valuable time will then be taken from the specific goal of training the students in scientific integrity and the course is likely to be neither short nor effective.

In addition to explaining the principles of research integrity, it also is important to be explicit

about the importance of adhering to these principles. Thus, the first few lectures of the course should cover the following topics:

- 1) the general principles of Research Integrity (1);
- 2) how scientific progress is enhanced by adherence to integrity by all researchers;
- 3) how scientific progress is slowed by unethical behavior, or even the perception thereof; and
- 4) the direct impact of ethical misconduct in research:
  - i) wasted money by universities and funding agencies,
  - ii) wasted time by researchers who trust the results of others, and
  - iii) injury or death to patients (biomedical research).

The middle part of the course shifts to a preceptorial structure with faculty led discussions of selected reading material on recent cases concerning violations of research integrity. These case studies summarize the accusations, how they were investigated, the decisions that were reached, and penalties imposed, if any. These case studies can be found in the Annual Report from the Office of Research Integrity of the Department of Health and Human Services (3).

These case studies supply concrete examples of the topics discussed in the first part of the course. The vast majority of cases involve data fabrication and falsification. This also presents the opportunity to discuss types of research misconduct that are common but insidious: sloppy data taking and self-deception (4). In these instances, the researcher is not consciously violating the principles of ethical behavior. Unfortunately, because the misconduct is unconscious, there is no chance for self-correction (5). The case studies are useful in training the students against sloppy data taking and self-deception, which can appear to be, or easily become, data fabrication or falsification.

The case studies also present concrete examples of a new topic — the penalties suffered by researchers who are found to violate the principles of research integrity. The usual penalties(3) are disbaring from receiving federal funding for 3 to 5 years, monitoring of a researcher by the home institution, mandatory retraction or correction of publications, and

occasionally dismissal. Students initially consider these penalties too light and suggest criminal prosecution. The faculty member at this point can explain the severe ramifications of these penalties for the researcher's career.

The third, and last, part of the course is the most important for successfully conveying the principles of research integrity and the necessity of adhering to these principles. It requires each student to make a half-hour presentation to the class about a case of suspected unethical behavior in research that they have investigated through a literature search. The students are expected to use what they have learned in the earlier parts of the course in discussing the following points:

- 1) an explanation of what actions constituted unethical behavior, entailing enough of an explanation of the scientific research so that other students can understand why the behavior was unethical;
- 2) how the unethical behavior was uncovered;
- 3) what the motivation might have been for the unethical behavior;
- 4) what, if any, penalties (real or intangible) were suffered by the perpetrators; and
- 5) what penalties the student thinks would have been appropriate.

Information for these presentations can be obtained from books(6,7,8) on the subject, science magazines such as *Scientific American*, and with especially well-known and recent cases, newspapers and general readership magazines. Students are informed early in the course about the presentation and are told to choose a case as soon as possible. It is hoped that by giving the students several weeks to prepare for their presentation, they will use the time to follow a meandering path in their literature search and learn about several different cases. If two students choose the same case, the second student to notify the faculty member is instructed to pick another case.

## Results

The first two parts of the course give the students a customary introduction to the issues of research integrity. The third part of the course is crucially important for consolidating these issues. The students are enthusiastic about making their presentation and peer pressure motivates them to do a thorough job. The presentation forces the

students to “step into the mind” of a scientist who is behaving unethically. This obliges them to confront the temptations to behave unethically and solidifies the need for self-vigilance.

## **Conclusion**

A short course can be effective in conveying the necessity of integrity in research and in training the students on how to perform research in an ethical manner. For the course to be effective, the students must be required to take an active role. A class presentation by each student is of crucial importance and the most important element of the course.

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